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MONTHLY REVIEW

Published by the

American Electro-Platers Society

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A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTRO-PLATING

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The eighth annual convention of the American Electro-Platers' Society has been held in Rochester with even more than customary enthusiasm and success. Platers from all over the country have met, shaken hands, swapped stories and talked over their problems. It is impossible to overestimate the benefits derived from such meetings. We know of nothing more inspiring than the growth of the Society, a society of men who formerly were considered skilled laborers, but who have, through their own efforts, risen out of this class and are making themselves trained technical men. Their meetings are a revelation to one who has not grown accustomed to them. Here are men who have started at the bottom, who have worked and are working conscientiously and with all the energy in their power to better themselves and their professsion, not by force, but by educating themselves and their brother workers. They stand as a shining example of ambition honestly and straightforwardly applied. More power to them!

(From July, 1920, Metal Industry.)

MONTHLY REVIEW

Published by the

American Electro-Platers' Society

Editors' Office, 4156 Botanical Ave., St. Louis, Mo.

Vol. 7 JULY No. 7

EDITORIAL.

Our comment on the convention just held must be considered from a personal as well as an official viewpoint. It was a well planned and a plan well worked. The extra day this year gave that much more to provide for. There is no doubt that the entertainment provided was in advance of other conventions. This, of course, includes the many little get-together groups, renewing past acquaintances and making of new ones.

The business sessions, with reports of past year's work, was interesting and brought out progressive ideas for the future. It was decided to co-operate with a committee of the Metal Finishers' Equipment Association, at their request, to attempt to standardize the names of equipment and materials used in our line.

Several amendments to the Constitution were presented, several for the purpose of correcting existing business methods.

One presented was to increase the minimum dues to $6.00 per year, which carried without a single dissension, and as this could not take effect until June 1, 1921, a motion carried to levy a special assessment of 10%, or 50 cents per member, to care for expenses this year.

The amendment to admit certain assistant foreman platers to associate membership was lost on a close vote. However, it is well to note that the delegates opposed to the amendment represented the larger number of members of our society. A referendum vote will be taken on this question.

The officers elected for the year, whose names appear on opposite page, were elected without a contest, thus proving their work in the interest of our society the past year was appreciated. We bespeak for them the hearty co-operation of every member in the several branches that the year 1920-1921 may be one of great achievement for the American Electro-Platers' Society.

For a time it looked as if the 1921 convention would not be provided for, but Newark and Indianapolis were there with invitations. Newark finally withdrew, and it was voted to accept the hospitality of Indianapolis.

Resolutions were adopted thanking Rochester Branch members and their ladies for the successful convention.

REPORT OF SUPREME PRESIDENT AMERICAN ELECTRO-PLATERS' SOCIETY TO 1920 CONVENTION.

Membership.

The Secretary's report shows that we have at present 715 active, 115 associate and 40 honorary members, a net gain of 67 new members, making a total membership of 870 members in good standing. In all, 127 new names were added to the roll. This is encouraging and is in keeping with the previous year. One factor should be taken in consideration that many of the branches have raised their application fees from $1.00 to $5.00.

Several branches report an increase in applications for membership since they advanced their application fee.

It is the opinion of your President that this should be made a standard fee for all branches.

Requests directly and indirectly have been received at this office for membership by superintendents, technical engineers and factory managers at various times as associate members. It might be stated that these inquiries are generally from a high type of men, and those who might be of material value to the Society in various ways. They are mostly members of many of the engineering societies who are liberal in their classification as to membership and have thereby built up a large member ship. Your President recommends that the situation might be brought up for discussion and consideration at this meeting.

Finances.

The Treasurer's report shows total receipts of $2,443.53 and total disbursements $1,458.80, leaving a balance on hand of $984.73, and a net gain of $39.63.

You will note that strict economy has had to be practiced, due to the constant increased cost of things, principally the cost of publishing the Review, which has been increased about 30%.

This small margin does not meet any prospective future needs of expense, and the treasury should not be stinted to such extent to invite a deficit and that such has not been the case at this time is due to the careful management of the Editor and Treasurer.

It is evident, therefore, that increased revenue must be derived in order to conduct the business of the Society properly. An increase in per capita tax should relieve this. Approximately 15% increase may be sufficient to meet this. It is suggested that an increase be made by raising the minimum fee for dues to $6.00 per year, which will then cover the capita tax to the Supreme Secretary, giving the branches 20% increase in revenue. This would then allow the Supreme Society about 40% instead of 35%, as at present.

Educational.

There has been no definite method of procedure along educational lines, but it is to be noted that certain branches have become very active locally and have contributed steadily to the

Review. Among papers or methods published that have been of particular interest was Mr. Lovering's "Magic Fluid" and Mr. Royal F. Clark's paper on the "Making of Phonograph Records."

Your President suggests that the various branches get in touch with representatives of the National Safety Council and secure some speaker to address at least one meeting during the year on "Safety First." There is an element of danger, especially in the polishing department, and such instructions might tend to guard against them.

During the months of August and September, 1919, Dr. Wm. Blum of the Bureau of Standards, and honorary member of the Society, contributed largely in his illustrational lecture, **"FACTORS GOVERNING THE STRUCTURE OF METAL DEPOSITS,"** to the educational features among the branches. We believe that there has been nothing of such interest and educational value presented before the Society heretofore that has created greater interest. In our opinion, such lessons can serve more to excite interest and enthusiasm and is better understood by the average plater than any other method. Undoubtedly this is a very practical plan to familiarize the manufacturer with the needs of research in electro-plating and also to materially aid us in raising funds to continue investigations at the Bureau.

Research and Publicity.

To replace the inactivity of the Educational Committee in the past, the Research and Publicity Committee was originated and appointed at the Philadelphia convention with the belief and intention that, with a broader scope of activity these two committees might create a greater agitation of interest in the research work conducted at the Bureau of Standards for the Society and the plating industry as a whole among the membership, and also be the means through which the Society might secure a certain amount of needed publicity.

Mr. Walter Fraine, Past Supreme President, was appointed chairman of the Research Committee and Geo. B. Hogaboom chairman of the Publicity Committee. It was found later, however, that the functions of these two committees were so closely associated that the work might be simplified to some degree; also prevent any misunderstandings or controversies that might arise. In other words, a more efficient program might be followed by merging the two committees. Accordingly, in September last, Mr. Hogaboom tendered his resignation as chairman of the Publicity Committee, which was accepted, and Mr. Walter Fraine was appointed as chairman, and the two committees combined into one joint committee. Officials of the National Industrial Conference Board offered their support in the work outlined and which might have aided us materially. However, in session the support offered was turned down by the Board, claiming that it was beyond their jurisdiction.

This then left us in the same position as before, and, inasmuch considerable faith had been placed in the N. I. C. B. and some time had been spent in correspondence, it was found too late to outline any new plan of procedure, and the original plan decided upon, that of appealing to the manufacturers through the Bureau of Standards for contributions to support investigations of research in electro-plating, inasmuch as Congress thus far has refused to make appropriation to carry this work along.

The committee appealed for co-operation of the branch secretaries, which was essential in this later plan, principally in furnishing addresses of manufacturers in their respective districts, especally those who operated plating departments.

Your President regrets to state that apparently this has not been forthcoming, and up to the present time nothing has been accomplished, but recommends that a committee of this kind be continued.

Employment Bureau.

The Employment Bureau has fully performed its functions and has been the means of placing many of our members in positions. Generally speaking, these have proven good positions. The demands have far exceeded the supply. Manufacturers or employers are fast becoming acquainted with the fact that the average plater of higher intelligence is invariably a member of the American Electro-Platers' Society. Furthermore, he has resources to information that the outsider does not have the opportunity to enjoy, and is apt to make him a more valuable man to the employer.

It is recommended that members who are open for positions should at all times furnish sufficient information to the Secretary regarding qualifications, salary expected and class of work preferred and locality desired. This will hasten matters materially in securing a situation and furnish a handy reference for the Secretary's office.

Review.

It is needless for me to call your attention to the able and efficient service rendered by the Editor. Mr. Williams has been a great help during the year, and with his experience as Past President and his practical common sense way of doing things, has kept the Review full of interest and in the front rank. I wish to take this opportunity of expressing my appreciation for the hearty support and co-operation received from him during the year.

The increased cost of printing and financing the Review calls for increased service. We do not believe it is advisable to cut down the pages, but to increase the number, if anything. Naturally this cannot be done under the present conditions, and it is strongly urged that provisions be made for the coming year.

New Branches.

We are pleased to state at this writing we have the pleasure of announcing that Boston Branch was organized June 4th, and

prayed for temporary charter, which has been granted, and is now operating under dispensation. Considerable enthusiasm was displayed at this gathering, and we look forward with confidence that Boston Branch will prosper. We wish to congratulate and thank the gentlemen who so freely gave their assistance in organizing this branch.

Charters.

Pittsburgh Branch, which was voted a permanent charter at the Philadelphia convention, has received her charter. Also Grand Rapids, who had been waiting for same since the Detroit convention. The delay was due in endeavoring to locate the cut that had been used in printing the first charters, which had been exhausted. This eventually could not be found; therefore, it was necessary to have a new one made; also new charters printed. We have now sufficient on hand to last a long time. At this time it might be well to point out that it is illegal to hold a meeting without the charter properly displayed where the meeting is held.

General.

During the early part of 1918 the Executive Board granted permission to the branches to exercise a sliding scale in payment of per capita tax to the Supreme Society. The object was to allow an extension of time, especially to the smaller branches, several of whom were unable to retain their members and meet their obligations when due.

The Supreme Secretary informed me that due to the increased cost of things this might seriously affect the treasury, and requested that this ruling be rescinded. The matter was referred to the Executive Board and the suspension of the ruling upheld.

Pittsburgh Branch appealed for a ruling regarding a member who had been admitted to membership in their branch and had previously been a member of Milwaukee Branch. Milwaukee Branch objected, claiming that this party was still in arrears for a year's dues. The member in turn stated that he had paid a year's dues and requested to be dropped, and the Secretary of Milwaukee Board had neglected to do so. From the evidence presented there appeared to have been errors on both sides. The matter was adjusted, however, by Pittsburgh Branch paying the obligation to Milwaukee Branch.

Cleveland Branch inquired as to the legality of advancing their dues to $10.00. No objection could be found to this, and the matter settled accordingly.

Conclusion.

In conclusion I wish to extend my appreciation for the cordial relations and co-operation I have received from the Secretary's office at all times. Also the courteous and friendly treatment from the members throughout the Society. We might simply add to this, that we have endeavored to manage the affairs of this office honestly and we hope, efficiently, without fea-

or favor, to the best interests and welfare of our beloved Society. Our conscience has been our guide and your confidence our reward.

Respectfully yours,

OSCAR E. SERVIS,

Supreme President, American Electro-Platers' Society.

ANNUAL REPORT OF THE SUPREME SECRETARY, AMERICAN ELECTRO-PLATERS' SOCIETY, 1919-1920

Rochester, N. Y., June 30, 1920.

To the Officers and Delegates to the Supreme Convention, American Electro-Platers' Society.

Gentlemen:

In accordance with our laws, it is my pleasure and duty to submit to you the conditions of the Supreme Society, as shown in the report for the fiscal year ending May 31, 1920.

I am pleased to report that the year has shown a gratifying increase in membership. The total membership May 31, 1919, was 803, the total membership May 31, 1920, is 870, (representing 19 Branches) consisting of 715 Active, 115 Associate and 40 Honorary. This shows an increase over last year of 21 Active, 32 Associate and 14 Honorary members. Now while this does not look very encouraging, I may state that the number of Active members elected during the year was 113, Associate 11, and Honorary 3, making 127 members elected during the year. In reference to Honorary members the membership lists submitted to the Supreme Office during the year show 40 Honorary members, an increase of 14 over last year, of which the Supreme Office has received but three (3) stubs. During the year 6 died, 17 resigned, and 37 have been suspended for non-payment of dues, which makes a total loss for the year of 60 members, and a net total gain over last year of 67 members. This report is taken from the books of the Supreme Office, as sent in during the year by the Branch Secretaries, although they do not correspond with the yearly report sheets or delegates' credentials sent in at the end of the year.

The Per Capita tax returns for the first quarter were very disappointing, the Branches being quite slow in paying up. The second quarter was quite encouraging, and the third quarter was very good, all paying up all their bills but one Branch. This no doubt was due to the fact that the Executive Board on September 18th, unanimously voted to rescind the privilege of Branches paying their Per Capita tax on paid-up members only. The fourth quarter was quite fair, only four Branches being delinquent, and they have all met their obligations and are now in good standing.

In October, 1919, a permanent Charter was sent to Pittsburgh Branch, and in January, 1920, one was forwarded to Grand Rapids Branch.

In September a protest was received from Milwaukee Branch regarding a member who had been admitted as a charter member of Pittsburgh Branch. The matter was settled eventually by the member paying the amount claimed and being granted a transfer to Pittsburgh Branch. A similar case occurred last year, and another case of a member getting a transfer from Bridgeport Branch to New York Branch about the middle of the fiscal year, which was accepted by the New York Branch, which made a request upon the Bridgeport Branch for a refund of six months' dues to the branch on behalf of the member. Bridgeport decided to pay the per capita tax on the member until the end of the fiscal year, instead of paying the rebate, then the member could not be accepted as a New York member until June 1, 1920. These matters are cited so as to impress upon the members and delegates that it is absolutely necessary that a member be in good financial standing in his own branch before accepting him as a transfer member, and would earnestly recommend legislation at this session to provide a transfer card system, and shall introduce an amendment to our Constitution for your consideration to cover this point; also several other resolutions which I believe to be essential for the successful conduct of the Supreme Office.

The Employment Bureau has been very active during the year, the demand for platers being far in excess of the supply, which is apparently due to the greater financial inducements offered in other pursuits and the lack of apprentices entering or following up electro-plating. Forty-five requests were received from manufacturers for foreman platers, also several requests for assistant platers and for polishers. Twelve of our members requested information regarding positions. As only three have notified me of their acceptance of a position, I have no knowledge of how many were placed in a position.

Referring to the estimated budget submitted at the Philadelphia convention, which was: receipts $2,390.10, expenditures $1,345.00. Our total receipts for the fiscal year were $2,443.53 and total expenditures were $1,458.80, leaving a balance of $984.73 on hand at the end of the fiscal year, making a net gain of $39.63, which is rather a small increase. The receipts were $352.16 over the last fiscal year, and the expenses were $312.53 over last year, which was due to the increase in the cost of printing the Monthly Review (which was $154.05 over last year), and other printed matter. This brings to your attention the necessity of taking some action at this session of either increasing the revenue of the Supreme Society or decreasing the expenses, as the present per capita tax will not be sufficient to carry through the coming year. The Review at the present basis will cost 15% over the year just ending, and other printed matter in proportion. It may be advisable to have new constitutions printed this year, as we have none that are up to date, and Section VII, Article 2 of the branch societies make it obligatory

for each newly elected member to receive a copy of the Constitution.

On June 4th your Secretary had the pleasure of attending a meeting in the City of Boston, Mass., for the purpose of assisting in the formation of a branch there, which I am pleased to inform you, that owing to the energetic efforts of Messrs. Samuel Herrick of Providence, and F. J. Clark of New York, we were successful in forming a branch, and a temporary charter has been forwarded to them. Personally I believe that we are going to have a very strong addition to our ranks in this branch. I have also forwarded to Mr. F. X. Burke of Cleveland, Ohio, the necessary printed matter for the organization of a branch in Columbus, Ohio, which we have reason to believe will be accomplished in the near future. I have also been informed that a movement is on foot to start a branch in Jamestown, N. Y.

In conclusion, I wish to thank all those who have assisted me in conducting the business of this office, especially those branch secretaries who have been prompt in sending in all necessary reports, stubs and per capita returns on time.

Respectfully submitted,

JOHN E. STERLING,
Supreme Sec'y-Treas.

THE SECRETARY-TREASURER, AMERICAN ELECTRO-PLATERS' SOCIETY, IN ACOUNT WITH THE SUPREME SOCIETY FOR THE FISCAL YEAR ENDING MAY 31, 1920.

Balance Sheet Showing Receipts and Disbursements.

RECEIPTS.	
Cash on hand and in bank on June 1, 1919	$ 945.10
Back payments on 1918-1919 account	106.07
Per capita tax	1,327.39
Membership cards	39.87
Applications	7.20
Constitutions	6.90
Charters	10.00
Envelopes	1.00
Total	$2,443.53

DISBURSEMENTS.	
Convention expense Phila. Steno. Report	$ 80.00
Publication of Review	917.00
Pres. office expense	16.00
Pres. travelling expense	15.00
Printing charters	17.50
Printing amendments	6.50
Printing 200 membership cards (1919-1920)	4.50
Printing 1,000 membership cards (1920-1921)	7.00
Secy's. office expense	32.42
Secy's. mileage to Philadelphia Convention	62.66
Adv. in Metal Industry	7.00
Adv. in Brass World	15.00
Research-Publicity Comm.	13.25
Employment Bureau	5.58
Editor's office expense	37.79
Editor's mileage to Philadelphia Convention	61.60
Editor's salary	100 00
Secretary's salary	60.00
Total	$1,458.80

RECAPITULATION.

Total receipts	$2,443.53
Total disbursements	1,458.80
Balance	$ 984.73

JOHN E. STERLING,
Treasurer.

EDITOR'S REPORT.

While we do not consider the entire report of the Editor of sufficient interest to publish, we give below a list of material published and reports of meetings as received from each branch during year just ended:

Branches.	Reports of Meetings.	Pages of Material Printed.	Number of Papers on Hand.
Bridgeport	8	5	3
Chicago	12	39	—
Cincinnati	5	0	—
Cleveland	6	1½	—
Dayton	1	0	—
Detroit	8	11	—
Grand Rapids	4	3½	—
Indianapolis	1	0	—
Milwaukee	6	0	1
Newark	9	1	—
New York	12	25	2
Philadelphia	5	5½	—
Pittsburgh	9	2	—
Providence	3	0	1
Rochester	9	2	—
St. Louis	12	4	—
Syracuse	1	0	—
Toronto	8	0	—
Toledo	1	0	—
Boston	1	0	—
Bureau of Standards	—	12	1

In presenting the invitation of Indianapolis Branch, Mr. Aufderheide was rather modest concerning the entertainment features, but was strong on having it understood that the program would be a practical one; and we are told that the ladies of Indianapolis would more than do their part for visiting ladies.

"Foremen electro-platers" who are bachelors please take notice: It is now quite fashionable to take in the convention on your wedding trip. We have the evidence. Mr. and Mrs. A. Barrows of Akron, Ohio; Mr. and Mrs. F. Cyrex of Chicago, Ill., and Mr. and Mrs. E. Neun of Toronto, Ont., received congratulations at Rochester.

PRINCIPLES OF ELECTRO-PLATING. IV.*

By Dr. O. P. Watts.

(Continued from June "Monthly Review.")

Experience has shown that some plating solutions may be acidified, while others can contain only a trace of acid without lowering the current efficiency to such a point that the solution is of no use for commercial plating. It is to be expected that the addition of any acid which attacks the deposit rapidly will lower the efficiency, e. g., nitric acid attacks copper very vigorously, and the addition of much nitric acid to a copper sulphate solution lowers the efficiency of deposition much more than the addition of an equivalent (not the same weight) amount of sulphuric acid would do.

Although sulphuric acid attacks niekel but slowly, the addition of a very moderate amount of this acid to the nickel bath greatly reduces the amount of nickel deposited. The reason for this is seen from the list of potentials in sulphate solution. The formulae of the acids tell us that they are all compounds of hydrogen, and they may be regarded as salts of hydrogen. (Write the formulae for nitric, hydrochloric, and sulphuric acids, and for several of their salts.) The addition of acid to the nickel bath was putting in a salt of hydrogen; since hydrogen is lower in potential than nickel in sulphate solutions, if there is much of it present in the electrolyte it will plate out in preference to nickel, resulting in a low efficiency of deposition of nickel. When a copper sulphate solution is acidified by sulphuric acid there is no plating out of hydrogen, because copper is the lower in potential, is therefore deposited in preference to hydrogen, and so long as there is plenty of copper present no hydrogen will be deposited. The potential, at which hydrogen plates out of cyanide solutions has not been determined, but its deposition along with copper and its failure to appear in silver plating indicate that in cyanide solution the potential of hydrogen is much below that of copper, and slightly above that of silver.

One of the list of problems which platers would like solved, given by Mr. G. B. Hogaboom at the meeting of The American Electrochemical Society, in April, 1916, was the following:

"No. 15. A dip to produce a brass coating on iron and steel by simple immersion, similar to a copper dip."

We have seen that to produce a deposit on iron by immersion it is necessary that the metal deposited have a potential lower than iron, and for the deposition of an alloy that the potentials of the metals constituting the alloy shall be fairly close together; to solve this problem then requires the finding of some solution in which the potentials of copper and zinc are close together, and in which the potentials of both of these metals lie below that of iron. There is no solution known in which the potential of zinc is below that of iron, and it is not probable that such a solution exists.

*Rights reserved by Dr. Watts.

The Deposition of Alloys.

Although brass is today the only alloy whose deposition is of any importance to the plater, it may be worth while to consider briefly the principles which govern the deposition of alloys. The first thing to be considered when desiring to deposit an alloy of any two metals is their potentials; if a solution can be found in which these are close together, and in which both metals are soluble, an alloy can probably be deposited.

There is a tendency for the metal whose potential is lower to deposit in larger amount than the other metal. Any action which helps to supply more of the metal of lower potential to the film of electrolyte in contact with the cathode, from which deposition takes place, will increase the proportion of this metal in the deposit; increasing the amount of this metal in the electrolyte, heating, and stirring have this effect.

For depositing a single metal a strong solution is usually desirable, since it permits the use of a high current density, with a consequent saving in the time required for a particular amount of work or an increase of output from a given number of tanks. For depositing alloys, however, a concentrated solution should be avoided. It is not possible to have the potentials of both metals exactly the same, and hence there is always a tendency for one metal to be deposited in larger proportion than the other, and if there is a great quantity of this metal in solution, it may be impossible to get the desired proportion of the other metal to plate out without the use of such a high current that the deposit will be spoiled.

Increasing the current density causes the deposit to contain a larger proportion of the more electropositive metal.

A brass bath when used cold gives a deposit of a fine yellow color; at the same current density what will be the effect of heating the bath to 150° F. on the color of the deposit?

Since yellow brass (70% copper) is deposited, copper is being removed from solution twice as fast as zinc, the film of electrolyte touching the cathode will contain less of each metal than the original solution, and will contain less copper in proportion to zinc than the main body of the electrolyte. The rate of diffusion is much greater in hot solutions, hence both metals are supplied to the film of electrolyte next to the cathode faster than in a cold solution, and this film approaches more nearly to the composition of the main body of the electrolyte, i. e., the effect of heat is to raise the proportion of copper in contact with the cathode, which causes more copper to be deposited.

For control of the composition of an alloy without resorting to chemical analysis it is necessary that the metals and alloy shall differ in color.

Rapid Plating.

In recent years much interest has been shown in increasing the speed of plating, particularly in nickeling. The one thing essential for rapid plating is to maintain an abundant supply of

metal in actual contact with the object which is being plated, so that large currents may be used without "burning" the deposit. Conditions which contribute to this end are:

1. The use of an electrolyte which contains a large amount of metal.

2. Heating the solution.

3. Constant circulation or stirring of the solution, or motion of the objects which are being plated.

By combining all of these the maximum rapidity in plating is obtained. The reasons for this have already been pointed out.

Operation of the Different Plating Solutions.

The deposition of each metal presents problems of its own which require special treatment. It would be desirable to discuss the details of depositing nickel, copper, brass, silver and gold; but because of lack of time this text on plating must be discontinued at this point.

Information on operating the different plating solutions may be found in such books on plating as:

Langbein's Deposition of Metals.

Barclay & Hainsworth's Electro Plating.

Apparatus Needed:

2 meter sticks, with inches on back; can be obtained from any dealer in physical and chemical apparatus. Cost about 40c each.

1 glass cylinder graduate 500 cc.

1 glass cylinder graduate 100 cc.

1 simple pan balance for rough weighing and set of weights from 1 kilogram to 1 gram.

*1 six volt voltmeter.

*1 or more ammeters, range 5 amp.

*2 or 3 rectangular wood boxes made water tight by paint or paraffine.

*These are for measurement of the resistivities of plating solutions; the resistance of plating tanks can be measured by means of the ammeter and voltmeter already on the tanks.

International courtesies conflicted, we are told, when the challenge of Dan Wittig of Milwaukee was not accepted by W. Salmon of Toronto. Wittig wanted to defeat him on his own soil while we were at Cobourg. No, this was not to be a fistic encounter, but a foot race.

A telegram was received at the banquet from Frank Rushton, now at Mexico City, Mexico, conveying his best wishes for a successful convention. We thank you, Frank, and assure you that it was.

SUMMARY.

THE EMBRITTLING EFFECTS OF CLEANING AND PICKLING UPON CARBON STEELS.

By S. C. Langdon and M. A. Grossman.

Introduction.

This investigation was conducted at the Bureau of Standards during the last year. As originally planned, it was intended to include the effects of electro-plating upon steel. Unfortunately, however, owing to the resignation of both of the authors, the work was necessarily interrupted at a time when the data upon plating was very incomplete.

This paper was presented at the spring meeting of the American Electro-Chemical Society and has been published in their transactions. A limited number of reprints of the entire paper have been obtained by the Bureau of Standards and will be furnished upon request to persons who are especially interested in the details of the investigation. Such requests should be addressed to the Bureau of Standards, Attention Division V., Section 2.

Summary.

The results obtained in this investigation may be summarized as follows: These effects were obtained by measuring the brittleness of plain carbon steel rods by the alternating stress method and of plates by the Erichsen penetration method. They do not necessarily apply, quantitatively at least, to other methods or conditions (e. g., other values or rates of alteration of the stress), which may be employed for testing the brittleness of steel, or to special alloy steels. In view, however, of the large magnitude of many of the observed effects, it is probable that they are of general application.

A. Cleaning.

1. The strength of rods is practically unaffected by the removal of grease, either by means of organic solvents or by immersion in alkali.

2. The removal of grease from plates causes a reduction of about 10 per cent in the penetration values. That this change is probably due to a change in the surface condition rather than to an actual change in the physical properties of the steel, is indicated by the fact that the penetration value approaches the original if the plates are regreased, especially if after greasing they are slightly heated.

3. Vigorous pumice brushing causes a reduction in strength of both rods and plates. This effect is obviously due to the scratching of the surface by the pumice.

4. Electrolytic cleaning (as cathode) of rods or plates in the alkali cleaner does not produce any greater change than is caused by simple immersion in alkali.

B. Sand Blasting.

1. Sand blasting of steel rods in the "raw" state and also those which have been normalized, causes appreciable reduction in ability to withstand the alternating stress test. This effect is most marked with steel of relatively low or medium carbon content, e. g., up to 0.54 per cent, for which the reduction is about 40 per cent. For high carbon steel, e. g., 0.89 per cent, the effect is only about 10 per cent. The effects are about the same upon $\frac{1}{16}$ in. (4.8 mm.) as upon $\frac{3}{8}$ in. (9.5 mm.) rods.

2. If high carbon steel (e. g., 0.98 per cent) that has been hardened and tempered is sand blasted, it is actually rendered more capable of withstanding alternating stress.

3. Cold-rolled strip steel is only slightly reduced in ductility by sand blasting.

C. Pickling.

1. Pickling under "standard" conditions, i. e., 5 minutes in 2 N sulphuric acid at 50° C. (122° F.) produces the following effects on rods:

(a) The stock as received is rendered increasingly brittle with increasing carbon content up to about 0.54 per cent carbon. The brittleness produced in the high carbon steel is less marked.

(b) The brittleness produced in normalized steel rods decreases with increasing carbon content.

(c) The brittleness produced in hardened and tempered steel rods increases with increasing carbon content.

(d) These effects on rods were almost independent of size from $\frac{1}{8}$ in. (3.2 mm.) to $\frac{3}{8}$ in. (9.5 mm.) in diameter.

2. The "standard" pickling produced the following effects upon cold-rolled strip steel.

(a) The brittleness caused by pickling is greatest for steel that is "hardest," i. e., has received the greatest amount of cold work in its final stages of manufacture.

(b) Within the limits tested, the brittleness caused by pickling increases with the thickness of the strips.

3. Increasing the temperature of the pickling bath from 0° C. (32° F.) to 50° C. (122° F.) causes increased brittleness, but above 50° C. (122° F.) increasing the temperature has little effect.

4. The brittleness increases with the time of immersion in the pickling bath. This increase is most marked up to 5 minutes immersion, after which the increase in brittleness is more gradual. Effects produced by long immersion are no doubt due in large part to solution of the metal, and consequently reduction in dimensions.

5. Pickling in sodium acid sulphate (niter cake), hydrochloric acid, or hydrofluoric acid, produces practically the same embrittling effects as in sulphuric acid of equivalent acid concentration.

6. Nitric acid produces practically no brittleness in rods. It produces a slight reduction in penetration of strips, caused probably by the etching or roughening of the surface.

7. Electrolytic pickling, whether the steel is made anode or cathode, or is made cathode and then anode, or if alternating current is used, causes about the same degree of brittleness as is produced by simple immersion in the same acid for an equal period of time. No doubt the effects due to immersion occur simultaneously with the electrolytic pickling and may mask any minor effects of the latter. Electrolytic "pickling" as anode or cathode in a neutral sodium sulphate solution produced no brittleness, although hydrogen was evolved vigorously upon the cathode surface.

D. Treatment After Pickling.

1. Steel which has been rendered brittle by pickling becomes less brittle upon standing at ordinary temperature. With steel rods this recovery is nearly complete in three days. With steel plates the recovery is never quite complete, but reaches a maximum in about three days.

2. In air, at higher temperatures, the maximum recovery takes place more rapidly, e. g., in about 2 hours at 100° C. (212° F.), and in 10 minutes at 150° C. (302° F.). Heating to 200° C. (392° F.) does not further incerase the rate of recovery appreciably.

3. When the embrittled steel is heated in water at 100° C. (212° F.), the maximum recovery occurs in from 2 to 5 minutes. The rate of recovery of rods is practically independent of size, up to ⅜ in. (9.5 mm.).

4. Brittleness produced by pickling in sodium acid sulphate, hydrochloric acid, or hydrofluoric acid, is removed under the same conditions as that produced by sulphuric acid. What slight brittleness is caused by pickling in nitric acid is not reduced by heating under any of the above conditions.

5. In no case does strip steel give the original penetration values, even when the maximum restoration has occurred. The final value after pickling and heating is approximately the same as that obtained by nitric acid pickling. It is therefore believed that the effect of pickling consists of:

(a) A permanent effect, caused by the roughening of the surface.

(b) A temporary effect, due probably to occlusion of hydrogen.

6. Treatment of embrittled steel rods with oxidizing agents, such as nitric acid or potassium dichromate solution, does not produce any measurable decrease in brittleness.

We might get in bad if we fearlessly expressed ourselves on the ball game.

WHAT THE BRANCHES ARE DOING

Bridgeport.

Meets third Friday of each month in its laboratory, 260 John St., Bridgeport, Conn. Secretary, Louis J. Maraffi, 744 Hancock Ave., Bridgeport, Conn.

Our regular meeting was held June 18th in the Laboratory with a good attendance, President J. M. Dunne presiding. The following delegates were elected to represent Bridgeport Branch at the annual convention: J. M. Dunn, Amos G. Reeve, Geo. B. Hagaboom. A vote of thanks was given to the Banquet Committee, also to Mr. Oberrender, for their efforts in making our seventh annual the best ever.

Discussion of use of hydrofluoric acid in nickel solution proved very interesting, and this is being used by several of the members on a commercial scale with good results.

Four applications for membership were received.

Chicago.

Meets second Saturday of each month, 8 p. m., at the Briggs House, Randolph and Wells Sts. Secretary, R. J. Hazucha, 4224 W. 20th St., Chicago, Ill.

Our regular meeting was held June 12th, with President Thornton presiding, and all the new officers in harness. The president appointed the following members to serve on the Educational Committee: O. E. Servis, chairman; R. J. Hazucha, C. B. Wrout, F. Greenwald and J. C. Kretschmer. The president also appointed F. J. Liscomb, O. E. Servis and R. J. Hazucha to serve on the Library Committee.

Under the head of good and welfare F. J. Hanlon suggested that the new Educational Committee bring out the mechanical features of our craft for discussion, such as laying out plating plants, plating floors and ventilating systems.

The Educational Committee brought out the subject of rust-proofing nickel, and a very lively and interesting discussion followed. It is claimed that steel cyanide copper-plated for 10 minutes, then zinc-plated long enough to cover the surface, then again cyanide copper-plated and then nickel-plated, would stand the corrosion test better than any other nickel plating. It was suggested that as long as it was copper-plated and then zinc-plated that brass plating might answer the same purpose and save all the different operations.

Our last regular meeting was held July 10, with a very good attendance.

The delegates made their report and considerable discussion followed. We had the pleasure of having with us Mr. Herrick from Boston, Mr. L. Shulte from Pittsburgh, Mr. Heil from Wichita, Mr. Willmore, Jr., and Mr. E. S. Thompson. These gentlemen all responded with a short talk.

Three applicants were elected to membership and five applications were read and Investigating committees appointed.

The following questions were asked, discussed and answered:

(Question No. 1.) Is there a standard acid test for testing nickel deposit?

(Answer.) Twenty per cent solution of nitric acid is generally used. This is dropped with a medicine dropper on a piece that has a known deposit and the time recorded. This serves as a standard, after which other pieces may be tested, and if the acid eats through before the required time, the articles have not the required deposit.

(Question No. 2.) My nickel plates dark. What can I do to make it plate whiter?

(Answer.) Add some nickel salts and boric acid.

(Question No. 3.) Does an electrolytic nickel deposit become more brittle and hard as the solution becomes alkaline, same as when becoming acid?

(Answer.) The deposit becomes hard and it often peels.

(Question No. 4.) In automatic plating it was necessary to reduce the time of pickling mill scale on steel to 3½ minutes. How can it be accomplished?

(Answer.) It was suggested that a solution composed of 3 gallons hydrochloric acid, 1½ gallons sulphuric acid, ½ gallon nitric acid, 5 ounces sodium chloride and 50 gallons of water. This solution should be used hot.

St. Louis.

Meets third Saturday of each month at Barr Branch Library, corner Jefferson and Lafayette. Secretary, H. H. Williams, 4156 *Botanical Ave., St. Louis, Mo.*

At our June meeting the officers elected for present term were installed by G. S. Robins, and delegates to convention were given instructions to present resolution requesting that future conventions be held on more conservative financial basis, not in any way as a criticism on past conventions, but to keep the expenses within the resources of any branch.

At our July meeting the delegates to convention made a report and E. W. Mueller told of his trip to Sherrill, N. Y., to visit the "Community Silver" factory. Mr. F. Odenz of Chicago Branch, now located in our city, was a welcome visitor. It was decided to hold our August meeting at Ebsen's Grove, Belleville, this being our annual outing for members' families and friends. No one need to walk, for "Harry" will take you in his delivery.

Dayton.

Meets first Saturday of each month at the Y. M. C. A, Dayton Ohio. Secretary, Alphonz Lamoureux, 432 E. Second St.

Providence—Attleboro.

Meets first and third Thursdays of each month at 26 Custom House Street, Room 16. Secretary, Clayton J. Poyton, 269 Ohio Avenue, Providence, R. I.

It has been mentioned by some of our outside members of the Providence-Attleboro Branch that we are holding back in giving any information and that we wish to receive, but do not wish to give any formulas or wrinkles. It is not that we do not want to give anything away, but we are a modest crowd of fellows and think of our work as an every-day occurrence, and that members in other branches know all we know and some more, not considering that members in other cities have a different class of work.

Our editor of the Monthly Review wants to call a number after each branch, so it is up to each branch to contribute something.

The following is my method of coloring Rose-Gold on brass work:

Run your work in a black boil, then in a bright dip or a matt dip. If you prefer a dull finish, then use a copper smut as follows:

Take a three-gallon jar, filled with muriatic acid, put in as much carbonate of copper as it will take up. Put your work in this until it smuts, then take out and rinse in cold water. Immerse in a hot cyanide of sodium bath of 3 ounces of cyanide to the gallon of water; rinse in water. Run in a hot cyanide of copper solution for about 10 seconds to give it a good copper color, then run through an old Roman solution. Rub off the high lights with a string or a cotton wheel and bicarbonate of soda. Rinse well and tone off in a fine gold solution composed of 3 gallons of water, 15 dwt. of gold as a fulminate and just enough of cyanide of sodium to pick up your gold, and 9 ounces of phosphate of soda. Rinse in cold water, then hot water and dry in sawdust.

ALFRED SENECAL.

Indianapolis.

Indianapolis Branch holds its business meeting the second Saturday in each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

Indianapolis Branch held its regular meeting July 10th, with a fair attendance. The boys were enthusiastic over the fact that the next convention will be held here, and very forcibly announced, "we will make it a real live one."

Geo. Barrows threw some good cheer into the boys by his method of entertaining. I am not sure whether he brought it from Canada or Rochester. One application was received.

I have hopes of getting in better reports in the future, as I really believe we are going to wake up.

Grand Rapids.

Meets on the second Wednesday of the month at The Morton House. Secretary, J. B. Hawley, 1317 Jefferson Ave., Grand Rapids, Mich.

The July meeting of Grand Rapids Branch was unusually interesting.

Librarian Charles Whalley was asked to make the report of the Rochester convention and gave a talk on the convention in general, and Charles did not miss a thing, though this was his first convention.

He gave full credit to Rochester Branch for their splendid program of entertainment, and said "It was necessary to look at your watch and program, and then rush to the next thing, for everything was on schedule and the schedule was observed."

Mr. Whalley, however, offered a criticism to the effect that "there is rather too much entertainment and too little of educational in the work of the convention."

Mr. Whalley's peroration, in approval of our editor with regard to his stand in matters concerning the Review, was the best part of his address, and reflected genuine admiration for Mr. Williams.

Mr. Werft was then asked for a report on the ball game and reported the game as won by the team from the West, in spite of the umpire, who seemed to lack decision until coached.

Mr. Werft's position on the field being S. S., was excellent for the purpose of coaching.

Mr. Shultz then reported a few points he had caught while the rest of the delegation was asleep or dreaming.

President Allen then talked on convention sidelights, laying emphasis on the belief that the greatest benefit to the plater who attends our convention is in the personal contact with the other individuals attending.

Committees were appointed to draft by-laws for the branch and also to arrange for our annual picnic.

We were pleased to note an attendance of 100 per cent of our Kalamazoo members.

Newark.

Meets first, third and fifth Fridays of each month, 8 p. m., Foresters' Home, 20 Central Ave., Newark, N. J. Secretary, O. F. Carlson, 225 West Grand St., Rahway, N. J.

The meetings held by the Newark Branch June 4 and June 18 were fairly well attended, but most of the time was taken up by discussing the coming convention and outlining plans for the coming season.

It was voted to discontinue the meetings during the hot weather months and resume again at the call of the president, and in the meantime the trustees will endeavor to secure a suitable meeting place.

New York.

New York Branch of the American Electro-Platers' Society meets every second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York, N. Y. Secretary, John Burke, 110 Glen St., Brooklyn, N. Y.

President J. E. Sterling presided at the June meetings of the New York Branch of the American Electro-Platers' Society. Two applications for active membership were received and referred to the Board of Trustees. Past President T. B. Haddow installed the newly elected officers of the New York Branch.

The main topics under discussion were the resolutions and amendments to be submitted at the annual convention. Secretary J. Burke read a communication received from the United States Bureau of Standards, notifying the New York Branch their request was complied with. The following resolution, adopted by the New York Branch, was presented to the President of the United States of America:

> Be It Resolved by the New York Branch of the American Electro-Platers' Society, That we respectfully urge that the units of the metric system be adopted by Congress of the United States of America and the British Parliament as the exclusive legal standards of weights and measurements; and,
>
> Be it Further Resolved, That copies of this resolution be forwarded to the President of the United States of America (through the Bureau of Standards, Department of Commerce), and to the British Premier (through the Board of Trade), and all other legislatures concerned.

Boston.

President, Andrew Mackie, 831½ East 2nd St., South Boston, Mass.; Secy.-Treas., A. Talamono, 70 Yorktown St., East Somerville, Mass.

Regular meeting was held July 2 at the Quincy House at 8 p. m., with President Mackie in the chair.

One application was received.

It was voted to communicate with other branches and try to arrange some way of exchanging paper for discussion.

After the regular order of business the librarian gave us a very interesting talk, the subject being "The Applications of Science to the Electro Deposition of Metals," showng the real significance of the scientific control of electro-plating, and offering the best possible remedies for these troubles and to pave the way to practical efficiency.

A rising vote of thanks was given the librarian, Mr. Whitcomb, for his very interesting talk.

Meeting of July 15th called to order with President F. Mackie in the chair.

After the regular meeting we were given a very interesting talk by Mr. Lefaen on "The Preparation and Use of Rapid Nickel Baths."

A rising vote of thanks was given Mr. Lefaen for his very interesting talk.

After the talk we took up the question box:

(Question 1.) What is the best way to stop spotting out of brass or copper castings?

(Answer.) One way is use ½ gallon of acetic acid to 1 gallon of water and dry out in lukewarm water and then in sawdust. Another way is to use a weak pickle dip, standing 6 B. This will remove the oxide in the metal.

(Question 2.) What is a good way to treat copper work for silver plating?

(Answer.) By using a good mineral cleaner or by using a weak pickle dip after cleaning the work, before striking in your silver stick.

(Question 3.) What is the best way to plate zinc work in the silver solution?

(Answer.) It was found that the best way is to clean your work thoroughly in your cleaner and then rinse. Then strike in your silver stick and then into your silver solution. You will find this a very good way to do zinc work.

Cleveland.

The Cleveland Branch meets every second and last Saturday of the month at 1344 *East Prospect St. Secretary B. F. McCormick,* 1941 *West 77th St.*

On June 26th our meeting was fairly well attended, and after some discussion over the best course to pursue along educational lines for the coming year, our new librarian got a good idea of an outline for season's work. The editor of the "Monthly Review" was present and gave a short talk and also installed the following officers for the present term: President, W. D. Scott; Vice-President, J. C. Singler; Secretary-Treasurer, B. F. McCormick; Librarian, A. M. Finn, and the Board of Managers.

Delegates to annual convention elected were: E. W. Hale, B. Hengst and A. Barrows.

The new officers are optimistic and Cleveland Branch will get busy.

Our Supreme Secretary beat us to it this time, for we just received a letter from him. The closing words were: "Hoping to meet you in Indianapolis."

APPLICATIONS FOR MEMBERSHIP.

New York.

E. Haas (active), 504 E. 163rd St.....New York, N. Y.
Clarence Wilbur (active), 153 Schenck St.....Brooklyn, N. Y.

Newark.

Edward M. Ball (active), 107 Newton St.....Newark, N. J.

Indianapolis.

Chas. H. Kroner, 1004 W. South St.....Bluffton, Ind.

Boston.

Thomas J. McShane (active),
8 Haverford St., Jamaica Plain, Mass.

Bridgeport.

Arthur W. Thess (active), 209 Cook Ave.....Meridan, Conn.
Chas. E. Dunn (active), 37 Bodwell St.....Hartford, Conn.
Harry R. MacFadyent (active),
cr. Arrow Electric Co., Hartford, Conn.

Chicago.

Benjamin Konvalinka, 5737 W. 23rd St.....Cicero, Ill.
Carl Carites, 3049 Diversey Ave.....Chicago, Ill.
Fred Herbst, 1116 Lill Ave.....Chicago, Ill.
Andrew Nielsen, 1640 N. Rockwell St.....Chicago, Ill.
J. A. Robinson, 2320 Monroe St.....Chicago, Ill.

ELECTED TO MEMBERSHIP.

Chicago.

Harold E. House, 320 Chippewa St. .....Eau Claire, Wis.
Albert H. Buckendahl, 400 Woodlawn Ave.....Aurora, Ill.
Owen J. McKee, cr. Rathbone, Sard & Co.....Aurora, Ill.
Andrew Weiland, 1303 Eddy St.....Chicago, Ill.

St. Louis.

James H. Jordan (active), 4120 Shenandoah Ave..St. Louis, Mo.
Frank Menniges (active), 3205 Arsenal St.....St. Louis, Mo.

REINSTATED.

Indianapolis.

Chester McDowell, 1126 N. Morrison St.....Kokomo, Ind.

St. Louis.

T. F. Carson, 3725 Marcus Ave..... .....St. Louis, Mo.

Chicago.

C. J. Klein, 409 Middle Bay St..... .....Goshen, Ind.
Martin Danz, 2404 6th St..... .....Peru, Ill.